Practical Stabilisation of Acute Hand Injuries

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Purpose....

Hand injuries account for 5-10% of ED visits; ACC > 210,000/yr
Importance of early and accurate diagnosis
Review six injuries - key anatomy, typical mechanisms of injury, clinical findings
Outline practical stabilisation methods where appropriate
Highlight pitfalls in acute setting

- Flexor tendon injury
- Mallet finger
- Closed central slip rupture
- Volar plate injury
- UCL injury
- Wrist sprain
Flexor tendon injury “Jersey finger”

- FDP tendon rupture at insertion
- Most commonly occurs at the fourth finger
- Mechanism of injury: grabbing incident e.g. missed tackle
- Presentation:
  - swollen, bruised distal digit
  - finger in relative extension
  - inability to flex that finger.
Flexor tendon injury “Jersey finger”

- Routine examination of each tendon to each finger is key
- Associated avulsion fracture is common, but not always apparent

- Immediate referral to a hand surgeon is required as irreparable after 7-10 days.
Mallet finger

- Injury of the extensor tendon at its insertion onto the distal phalanx
- Mechanism of injury: sudden, forced flexion of an extended finger e.g. basketball, volley ball, baseball, or minor trauma e.g. making bed
- Presentation:
  - Unable to fully extend finger at DIP joint
Mallet finger

- **Tendon rupture**
  - or
- **Avulsion fracture**
  - <30% articular surface, no volar subluxation
  - >30% articular surface or volar subluxation → surgical management

→ Immobilise DIP in extension
  - Tendon: 6-8 weeks +2 +2...
  - Fracture: 4-6 weeks +2 +2...
Mallet finger

- **Splinting**
  - DIP joint extension, **PIP joint free**
    - Volar
    - Dorsal
    - Circumferential

- **Education**
  - Skin care
  - Tendon healing

- **Adherence**
  - If it bends start again!
Mallet finger

Outcomes

- No single splint superior (*Cochrane 2009*).
- Majority of complications due to skin breakdown, ill-fitting splint, and delayed treatment (*Minchin & Spirtos 2012*).
- Most important thing is patient compliance (*Cochrane 2009*).
- UK studies:
  - Custom made thermoplastic mallet splint:
    - < 5 deg extension loss, full flexion in 88% of patients (n=34) (*Richards 2004*).
  - Dorsal aluminium splint:
    - <10 deg extension loss, full flexion in 51% of tendon injuries (n=39) and 73% bony injuries (n=15) (*Katsoulis 2005*).
Swan-neck deformity

- With a disruption of dorsal mechanism at DIP joint, the entire power of extension is directed to the PIP joint.

- Over time, especially if volar plate is lax, this concentrated extension force results in PIP joint hyperextension and a swan-neck deformity
  - i.e. DIP joint rests in an abnormally flexed position and the PIP joint rests in a hyperextended position

- Thus, even if mallet finger is not particularly symptomatic from functional or cosmetic perspective, treatment is essential to preclude development of swan-neck deformity.
Mallet finger

▲ Pitfalls
  □ Skin breakdown due to ill-fitting splint, poor hygiene, or tape allergy
  □ PIP joint immobilised → PIP joint stiffness +/- swan neck
  □ Move too soon → lag
  □ Inadequate education

▲ Failed treatment/untreated
  □ Swan-neck deformity
Closed central slip rupture (Boutonniere)

- Injury to the central extensor tendon at insertion onto base of middle phalanx
- **Mechanism of injury**: hyperflexion or volar dislocation, commonly in athletes, particularly ball sports.
- **Presentation**:
  - At acute stage - may not lag at PIP if lateral bands not yet subluxed volar ward; but will be painful or give way on resisted extension.
  - At chronic stage - fixed flexion
  - Positive Elson’s test
Central slip - attaches to the base of the middle phalanx

Lateral bands

Oblique retinacular ligament (ORL) - passes volar to the PIP joint and dorsal to the DIP joint

Triangular ligament
**Extensor mechanism**

- **Central slip** - attaches to the base of the middle phalanx
- Lateral bands
- Oblique retinacular ligament (ORL) - passes volar to the PIP joint and dorsal to the DIP joint
- Triangular ligament
**Extensor mechanism**

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Extensor mechanism

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Extensor mechanism

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Modified Elson test

Which finger has central slip rupture?
A positive Elson test is DIP joint rigidity while attempting to extend the PIP joint from a flexed position. This rigidity is due to the recruitment of the lateral bands to help extend the PIP joint in the setting of a deficient central slip.

Schreuder 2006
Closed central slip rupture (Boutonniere)

- Tendon rupture
  - or
- Avulsion fracture
  - <30% articular surface & <2mm displaced
  
  → Immobilise PIP in extension 4-6 weeks, DIP free
  → Protected mobilisation 2-4 weeks (Short Arc Motion, SAM)
  → Night splint further 2 weeks

- >30% articular surface or >2mm displaced → surgical management
Closed central slip rupture (Boutonniere)

- **Splinting**
  - PIP joint full extension, DIP joint free
  - Range of splints
  - Comfort, fit and tolerance
  - Serial splinting to achieve full PIP joint extension

- **Exercises** (in the splint)
  - Isolated DIP joint flexion
  - MCP flexion + PIP extension

Not for acute setting:
Closed central slip rupture (Boutonniere)

- **Pitfalls**
  - Skin breakdown due to ill-fitting splint, poor hygiene, or tape allergy
  - DIP joint immobilised → ORL tightness, ↑ deforming forces
  - Untreated oedema worsens deforming forces
  - Persisting ORL tightness → quadregia effect
  - Move too soon → lag
  - Failure to differentiate from collateral ligament sprain
- **Failed treatment/untreated**
  - Chronic boutonniere deformity
  - Early arthritis
Volar plate injury

- “Finger sprain” / PIP joint dorsal dislocation, with or without fracture
- Most common ligamentous injury in the hand
- **Mechanism of injury**: hyperextension or longitudinal compression e.g. netball/basketball
- **Presentation**: Spectrum of injury
  - Jammed finger to irreducible fracture-dislocation
  - Many incomplete disruptions
  - Swelling, bruising, +/- history of deformity +/- attempted reduction
- **Treatment based on accurate diagnosis of the pathological lesion**
**PIP joint**

- Hinge joint
- 0-110 degree range of motion
- Enveloped by soft-tissue ‘box’
  - Radial and Ulnar collateral & accessory ligaments
  - Volar plate
  - Dorsal capsule and central extensor tendon
- For dislocation to occur → at least 2 sides of the box damaged
PIP joint Volar Plate (VP)

“Move it or lose it”
Volar plate injury

- Volar plate commonly avulsed distally from base middle phalanx.
- Small flake fracture may be apparent on x-ray
- Bone fragments less than 20% articular surface are usually stable, or reduced by positioning in flexion.
- Bone fragments greater than 30% articular surface may be unstable → surgical management/review

Initial treatment, duration of splint protection and prognosis are related to post reduction stability.
Volar plate injury

- **Clinical management:**
  - **Grade I:** hyperextension injury
    - +/- VP avulsion; ligament split; joint surface intact
      - Dorsal block splint at slight flexion or buddy strap + gentle flexion 2 weeks, buddy strap further 2 weeks, longer for sport
  - **Grade II:** dorsal dislocation
    - Major ligament injury +/- avulsion fracture; <20% articular surface; no displacement
      - Dorsal block splint at PIP 20° + gentle flexion, gradually extend over 2-3 weeks, buddy strap further 2 weeks, longer for sport
  - **Grade III:** fracture dislocation
    - Proximal dislocation with fracture <30% articular surface; stable in flexion
      - Dorsal block splint PIP 30-40° + gentle flexion, gradually extend over 4-5 weeks, buddy strap further 2 weeks, longer for sport
    - or
    - Proximal dislocation with fracture >30% articular surface; irreducible → surgical review
Volar plate injury

▶ **Splinting**
  - PIP joint flexion 2-6 weeks
  - Maintain DIP joint slight flexion

▶ **Oedema management**
  - Compressive wrap or sleeve
  - Elevation
  - Gentle movement

▶ **Exercises**
  - PIP and DIP flexion (in splint)

↓ For later stage:
leftrightarrow Short term only, or remove distal tape to exercise
**Buddy-strapping**

- Determine collateral ligament involvement
- Determine fracture pattern/direction of instability
  - Choose which finger to buddy to
  - Aim for neutral alignment
Volar plate injury

**Pitfalls**

- Skin breakdown due to ill-fitting splint, poor hygiene, or tape allergy
- DIP joint immobilised in extension → ORL tightness → ‘pseudo boutonniere deformity’
- Prolonged immobilisation → intractable stiff finger with VP fibrosis
- Failure to diagnose collateral ligament involvement

**Failed treatment/untreated**

- Recurrent instability
- Flexion contracture
- Swan-neck deformity
- Traumatic arthritis